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Working Trees for Pollinators



Over 100 agricultural crop species in North America need a pollinator to be most productive.

Agroforestry practices can be designed to support these pollinators.



A bumble bee on a peach blossom

Photo by Nancy Adamson
NRCS ENTSC/Xerces Society

In the past, native bees and feral honey bees could meet the pollination needs of orchards, melon and pumpkin fields, seed producers, and berry patches because these farms were typically adjacent to areas of habitat that harbored important pollinators.

Today, farms in the U.S. are larger and have less adjacent habitat to support bees. Yet, the need for pollinators in agricultural landscapes has never been greater. Across the globe, the acreage of insect pollinated crops has more than doubled in the past 50 years.

At the same time, commercial beekeepers in the U.S. are losing an unsustainable percentage of

their hives of honey bees each year because of a combination of habitat loss, diseases and pests, and pesticide exposure. Native bee abundance and diversity is challenged as well. Almost 25 percent of bumble bees are facing dramatic population declines, and the abundance and diversity of native bees is lower in heavily developed landscapes. Ongoing research demonstrates, however, that these native bees play a vital role in crop pollination, and that their numbers can be increased.

Private landowners can do a lot to help support these critical pollinators by providing habitat

and flowering plants that provide food for pollinators.

Furthermore, for producers of insect pollinated crops, pollinator habitat and floral diversity on the farm can also pay dividends by improving crop pollination and reducing pest populations, while also supporting other types of production and natural resource conservation goals.

This brochure illustrates some of the most important pollinators for food production and their habitat needs. It also illustrates how agroforestry practices can be adjusted to meet not only the needs of pollinators, but also those of producers.

Pollinators Important to Agriculture

There are many pollinator groups including bees, moths and butterflies, bats, and birds. However, bees are particularly important crop pollinators. They gather and transport pollen and typically visit flowers from a single plant species during each foraging trip, which ensures that the correct pollen is transferred from plant to plant. Their hairy bodies have evolved to carry pollen and nectar, making them especially efficient. Bees also forage from a central nest and therefore stay in the area around a crop when their nests are close at hand. These behaviors set bees apart from butterflies and other pollinators, which tend to drift across the landscape visiting a variety of flower species where they gather nectar and transport pollen. Native bees are also able to shake (sonicate) flowers to release pollen, called “buzz pollination”.



Photo by Hope Abrams/flickr

Honey bees

Honey bees (native to Europe, Africa, and Asia) are the most well known and important managed crop pollinator. Honey bees live as large social colonies inside a hive or hollow space. They have diverse dietary needs and gather nectar and pollen throughout the growing season to feed their brood and store honey for the winter.



Photo by NYS IPM program at Cornell/flickr

Solitary ground nesting bees

Most native bees in North America are solitary species. A single female bee builds and provisions her own nest. Most solitary bees build their nests in well-drained sites with good sun exposure; some nest in river banks. Specialist ground-nesting bees pollinate squash, sunflower, and other crops.



Photo by Rob Cruickshank/flickr

Solitary wood nesting bees

Other solitary bees build their nests in narrow tunnels. These tunnels may be soft pithy centers of some twigs (e.g. box elder, elderberry, sumac, or caneberries); they may be made by wood-boring beetle larvae, or, in the case of carpenter bees, excavated by the bees themselves. Some wood nesting bees are managed for the pollination of alfalfa and tree fruit.



Photo by Elaine Evans

Bumble bees

Bumble bees' large hairy bodies make them especially effective pollinators. Bumble bees construct nests in small cavities, often in old rodent burrows. Queen bumble bees that mated the previous fall start nests in spring and by mid-summer their colonies can have dozens or hundreds of workers. Native bunch grasses, brush piles, or even piles of field stones provide habitat for bumble bee nests. Bumble bees are among the most important pollinators of certain berry crops.



Photo by Sarah Foltz Jordan/Xerces Society

Flies, wasps, beetles & more

Many other insects visit flowers. They can be valuable pollinators and provide important ecological services. For example, wasps, lady beetles, soldier beetles, lace wings, and hover flies consume crop pests such as aphids, thrips, and grubs (including Japanese beetles). These insects, along with bees, butterflies and moths, also are a critical food source for birds and other wildlife.



Photo by Steven Katovich/U.S. Forest Service

Monarch butterflies

The monarch is the most iconic and recognizable butterfly in North America. Monarchs complete a multi-generational annual migration, fanning out across the U.S. and Canada from overwintering sites in Mexico and the California coast. Monarch caterpillars feed on milkweed to complete their life cycle. Milkweed in turn feeds diverse bees and other beneficial insects. Although monarchs are not crop pollinators, they often are found near fields and pastures where milkweed grows.

Agroforestry Landscape



Agroforestry Practices Designed for Pollinators

Photo by Agroforestry Development Centre



Windbreaks or hedgerows

Agroforestry practices help reduce wind speed, making it easier for pollinators to fly and visit flowers. When planted with diverse flowering shrubs and trees, windbreaks can provide shelter, pollen, and nectar for pollinators, other beneficial insects, and wildlife. Windbreaks and other linear plantings can serve as buffers to drifting pesticides. To be pollinator friendly, windbreaks should not include plants that will attract pollinators when adjacent crops are sprayed. Planting wildflowers during establishment can enhance pollinator resources and reduce weed pressure.

Photo by Richard Straight/NAC



Forest farming

Many valuable overstory crop trees, like yellow (tulip) poplar, maple, basswood, and black cherry provide excellent pollinator habitat. Cultivated understory plants, such as ginseng, goldenseal, and black cohosh, may benefit from pollinator visits. For example, diverse bees pollinate black cohosh. Black cohosh does not produce nectar to attract bees, but relies on nearby prolific nectar producers, such as pale touch-me-not or whiteflower leafcup. The pollination needs of many forest-farmed crops is not well understood. Flies are likely important since some flies are active in cooler temperatures, when many of the forest crops flower.

Photo by Jessa Kay Cruz/Xerces Society



Riparian forest buffers

Riparian forest buffers are especially important for bees and other pollinators during hot summer months when upland plants may not produce nectar or pollen. Early flowering willows, as well as fruit and nut-bearing shrubs can provide additional farm income as cut flowers or produce, while also providing reliable food resources for pollinators. Honey bees may also visit muddy shorelines to gather water for cooling their hives.

Photo by Tracy Coulter



Alley cropping

Alley cropping presents an opportunity to grow plants in close proximity that have complementary flowering periods. By paying careful attention to bloom periods and using multiple species, an alley cropping system can provide nearly continuous pollen and nectar forage within a single farmscape. Consider flowering trees like black cherry, black locust, or basswood along with the more typical alley cropping trees of walnut, pecan, or oak. Diverse forbs and shrubs may be planted in rows for cut flowers, berry production, or the nursery market, as well as for pollinators. A legume forage crop between rows will not only fix nitrogen and help manage weeds, but also provide nectar and pollen for bees if allowed to flower.

Photo by Richard Straight/NAC



Silvopasture

Silvopasture provides an open understory where a variety of flowering forbs (forage legumes, such as alfalfa or clover, or native wildflowers) can grow. Rotational grazing practices can give these forbs an opportunity to recover from grazing or flower before being eaten. Harvestable flowering trees, such as basswood, black locust, maple, or yellow poplar can enhance a silvopasture system.

Pollinator Habitat Needs

The closer a nest site is located to pollen and nectar sources, the less energy female bees need to spend commuting back and forth, and the more resources they can put into their offspring. Also, if nest sites are located close to abundant nectar and pollen (within 250 meters), the bees are less likely to forage in areas outside of a grower's control. Many agroforestry practices lend themselves to diversifying agricultural landscapes to provide resources in close proximity.

Creating A Year-Round Bloom Cycle

Timing of bloom and diversity of flowers:

Pollinators need access to a diversity of plants with overlapping blooming times so that flowers are available from early spring until late fall (and over the winter in subtropical areas). When choosing flower species to plant for pollinators, an inventory of existing flowering species may help guide planting choices. Blooms through the season and a diversity of structural niches (for example, low-growing herbaceous wildflowers and grasses, flowering shrubs and trees) support a greater diversity of pollinators and other beneficial insects. See the resources section for links to pollinator friendly plant lists.



Other Benefits



► **Braconid wasps are parasites of many insect pests and are harmless to humans.**

Photo by Sarah Foltz Jordan, Xerces Society



Supply habitat for pest-controlling insects and pollinators

The diverse vegetation structure and floral resources that can be incorporated into agroforestry practices can provide shelter, food (in the form of pollen and nectar and prey), and places to overwinter for beneficial insects, such as predators or parasites of insect crop pests. These beneficial insects are a component of integrated pest management and can help to reduce the need for pesticides, thus reducing pesticide impacts on pollinators.

Food and specialty crop production

Many plants that produce pollen and nectar for pollinators also produce fruit and nuts that humans enjoy eating and can also be considered specialty crops, such as cut flowers and native seeds for restoration. Some food-producing trees include elderberries, persimmons, and many others.

Wildlife habitat

Many pollinator plantings can also benefit other types of wildlife by providing corridors, cover, nesting sites and food sources. Furthermore, the more abundant pollinators and other beneficial insects are, themselves, food for song birds and other wildlife

Additional Resources

- National Agroforestry Center pollinator publications: <http://nac.unl.edu/issues/pollinators.htm>
- Xerces Society Pollinator Program, <http://www.xerces.org/pollinator-conservation/> and Pollinator Conservation Resource Center, <http://www.xerces.org/pollinator-resource-center/>
- NRCS pollinator resources: <http://1.usa.gov/1VuSKNf>
- Forest Service pollinators page: <http://www.fs.fed.us/wildflowers/pollinators/>
- Ladybird Johnson Wildflower Center pollinator plant resources. http://www.wildflower.org/conservation_pollinators/
- Attracting Native Pollinators: Protecting North America's Bees and Butterflies. 2011. E. Lee-Mäder, M. Shepherd, M. Vaughan, S. Black, and G. LeBuhn. Storey Press. 371pp. <http://bit.ly/1XcKaj2>
- "Farming for Bees: Guidelines for Providing Native Bee Habitat on Farms," Vaughan, M., J. Hopwood, E. Lee-Mäder, M. Shepherd, C. Kremen, A. Stine, and S. Black. 2015. Xerces Society. 76 pp. <http://www.xerces.org/guidelines-farming-for-bees/>
- Using the 2014 Farm Bill Conservation Programs for Pollinator Conservation. <http://1.usa.gov/1Q6Vmsh>
- "Designed with pollinators in mind." Not Your Grandfather's Windbreaks. Inside Agroforestry. Vol. 20 Issue 1. <http://bit.ly/1ih0vDp>
- Farmscaping for Beneficials Program. Oregon State University <http://bit.ly/1XcWZtl>

Contact: USDA National Agroforestry Center, 402-437-5178 ext. 4011, fax 402-437-5712, 1945 N. 38th St., Lincoln, Nebraska 68583-0822. <http://nac.unl.edu>

The USDA National Agroforestry Center (NAC) is a partnership of the Forest Service (Research & Development and State & Private Forestry) and the Natural Resources Conservation Service. NAC's staff is located at the University of Nebraska, Lincoln, NE. NAC's purpose is to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land use systems by working with a national network of partners and cooperators to conduct research, develop technologies and tools, establish demonstrations, and provide useful information to natural resource professionals.

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